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ROBERT A. KENT P.O. BOX 1431 DUNCAN, OK 73536			EXAMINER LIGHTFOOT, ELENA TSOY	
			ART UNIT 1715	PAPER NUMBER
			NOTIFICATION DATE 05/17/2010	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ROBERT.KENT1@HALLIBURTON.COM  
Tammy.Knight@Halliburton.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/691,319	<b>Applicant(s)</b> NGUYEN ET AL.	
	<b>Examiner</b> ELENA Tsoy LIGHTFOOT	<b>Art Unit</b> 1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 19 April 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 18-29,31,32,35-46,48-61 and 63-77 is/are pending in the application.
- 4a) Of the above claim(s) 20-24,27,37-41,44,50-61,63,64 and 67 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18,19,25,26,28,29,31,32,35,36,42,43,45,46,48,49,65,66 and 68-77 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 19, 2010 has been entered.

***Response to Amendment***

Amendment filed on April 19, 2010 has been entered. Claims 30, 47 and 62 have been cancelled. Claims 18-29, 31, 32, 35-46, 48-61 and 63-77 are pending in the application. Claims 20-24, 27, 37-41, 44, 50-61, 63, 63, 64, and 67 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claims examined on the merits are 18, 19, 25, 26, 28, 29, 31, 32, 35, 36, 42, 43, 45, 46, 48, 49, 65, 66 and 68-77.

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 18, 19, 25, 28, 31, 32, 35, 36, 42, 45, 48, 49, 65, 66, 68-73, 75 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al (US

5,381,864) in view of Martin et al (US 4,969,523), further in view of Beck et al (US 4,493,875).

Nguyen et al '864 discloses a method of treating a subterranean formation comprising continuously forming and injecting a treating composition into a well (See column 12, lines 46-66). The treating composition comprises a mixture including both a carrier fluid and a particulate blend suspended in the carrier fluid, the particulate blend comprising a large particulate material and a small particulate material (See column 7, lines 29-34). The use of a particulate blend of a *large* particulate material and a *small* particulate material (See column 5, lines 54-56) formed by admixing one of the particulate materials with the other of the particulate materials (See column 6, lines 1-4) in a subterranean treating composition for treating subterranean formation provides permeability levels and production rates substantially superior to those provided by the single-sized small particulate systems used heretofore (See column 7, lines 6-15). Examples of particulate materials commonly used as fracturing proppants for gravel packing and frac-pack operations include: *sand*; *glass beads*; nut shells; metallic pellets or spheres; gravel; **synthetic resin pellets or spheres**; gilsonite; coke; sintered alumina; mullite; like materials; and combinations thereof (See column 2, lines 17-23). The composition includes a gelled aqueous carrier liquid (See column 9, lines 20-21) and a hardenable resin system which will consolidate the particulate blend to form a hard permeable mass (See column 7, lines 34-37). The resin system can be included as a precoating on the individual particles of the particulate blend (See column 7, lines 29-43). Generally, the hardenable resin system may include any *epoxy* resin system,

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*phenolic/aldehyde* resin system, or *other bonding resin* system used in the art for consolidating particulates to form permeable beds or flow paths (See column 10, lines 35-49). The hardenable resin system will preferably also include one or more surfactants which will improve the wettability of the particulate materials used in the treating composition and will thereby enable the hardenable resin system to **rapidly coat the particulate materials** (See column 12, lines 23-31).

As to claimed coating on-the-fly, Nguyen et al '864 further teaches that the components of the treating composition can be blended together using generally **any procedure which is commonly used** for preparing fracturing, frac-pack, and gravel packing compositions, e.g. by first mixing the gelling agent with brine or some other aqueous fluid to form the gelled aqueous carrier liquid, transporting the gelled aqueous carrier liquid to a mixing apparatus such as a **continuous stream tub mixer**, and **continuously adding the other components** and mixing with the gelled aqueous carrier fluid, and continuously drawing the resulting mixture from the mixer and injected the mixture into the well to a desired subterranean zone (See column 12, lines 46-66).

As to claimed particle size of 4-100 U.S. mesh, Nguyen et al '864 further teaches that the large particulate material consists essentially of particles smaller than about 4 mesh, but not smaller than about 40 mesh (See column 5, lines 58-60). The small particulate material consists essentially of particles smaller than about 16 mesh, but not smaller than about 100 mesh (See column 5, lines 60-62). In other words, Nguyen et al '864 teaches that the size of the "large" particulate material overlaps the size of the

“small” particulate material, i.e. the size of the “small” particulate material may be **similar or greater than about half the size** of the “large” particulate material.

Nguyen et al '864 fails to teach that the fracturing proppant is a composite of the “large” particulate material and the “small” particulate material wherein the “small” particulate material is a density reducing material comprising polystyrene divinylbenzene that has a specific gravity less than the coated “large” particulate material; the composite being made by providing a first flow stream with dense “large” particulate material and a separate second flowing stream with a density reducing material “small” particulate material (Claims 18, 35, 68).

Martin et al teaches that in recent times, it has been suggested that the efficiencies of gravel pack operations can be improved by the use of particulate materials and carrier liquids with more closely matched density ( $D_p / D_c$  approaching 1/1) to provide improved packing efficiencies for, particularly, the upper portions of the packed interval as well as the top perforations in a highly deviated or horizontal wellbore since the particles are essentially neutrally buoyant in the carrier liquid and thus are transported more efficiently to the top portions of a wellbore and perforations (See column 1, line 62 to column 2, line 6). The efficiently gravel packing of both the lower and upper perforations and portions of the wellbore annulus may be achieved by pumping **separately** the different density particles (See column 3, lines 57-58): the high density particles such as *sand* having a density of 2.65 alone (See column 3, lines 60-64) being present in a range of 90 to 10%; and the low density particles such as **polystyrenedivinylbenzene** (SVDB) beads alone having a density of 1.05 (See column

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3, lines 64-65) being present in a range of 10 to 90% and (See column 3, lines 45-56), e.g. a 50-50 mixture of sand and SDVB beads (See column 3, lines 65-66). The particle size was 20 to 40 mesh for the sand and 18 to 50 mesh for the SDVB beads (See column 3, lines 66-68). In other words, Martin et al teaches that low density SVDB having size overlapping size of sand, i.e. having **similar** size or **greater than about half the size** of the “large” particulate material are suitable for the use in a servicing fluid. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided separately “large” dense particulate material with a first flow stream and a separate second flowing stream with “small” low density SVDB particulate material in Nguyen et al ‘864 with the expectation of providing the desired particulate material with density closely matched to servicing fluid for improved packing efficiencies, as taught by Martin et al, since Nguyen et al ‘864 does not limit his teaching to particular combination of different particles or to particular synthetic resin pellets or spheres.

Martin et al does not explicitly teach that sand/SVDB particulate material that closely matches density of carrier liquids is composite particle having dense core particles coated with low density particles. However, **Beck et al** teaches that a composite proppant having reduced density approaching densities of typical fracturing fluids tends to avoid the settling problem (See column 1, lines 58-62) may be produced by coating large dense particles with small particulates of reduced density (See column 1, lines 58-69). The composite particles may be formed by (1) mixing the core particles with adhesive to provide adhesive-coated core particles, (2) while the adhesive is tacky,

mixing the coated core particles with hollow microparticles (preferably hollow ceramic microparticles) to adhere a plurality of the microparticles to each coated core (See column 2, lines 55-68), and (3) curing each adhesive composition to a nontacky state while keeping the individual coated core particles substantially out of adherent contact with each other (See column 3, lines 1-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have produced sand/SVDB particulate material that closely matches density of carrier liquids in Nguyen et al '864 in view of Martin et al as composite particles having dense core particles coated with low density particles with the expectation of avoiding the settling problem, as taught by Beck et al.

Note that Nguyen et al '864 teaches that hardenable epoxy resin **rapidly coats** particulate materials such as sand or glass beads in a treating composition in the presence of the gelled aqueous carrier liquid and a surface active agent (See column 12, lines 23-28). Obviously, SVDB *beads* added to the stream comprising resin coated particles **would adhere** to resin because Nguyen et al '864 teaches that the epoxy resin **rapidly coats sand or glass beads in the stream**.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have *continuously* formed a composite proppant in Nguyen et al '864 in view of Martin et al and Beck et al by adding a first stream of epoxy resin and large dense particles to a **continuous stream tub mixer** thereby forming resin coated large particles followed by adding a second stream of small particles of reduced



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density with the expectation of providing the desired composite proppant comprising large dense particles coated with small particles of reduced density.

As to claims 42 and 73, Nguyen et al '864 teaches that examples of epoxy resins preferred for use in the present invention include: diglycidyl ethers of bisphenol-A; diglycidyl ethers of bisphenol-F; glycidyl ethers of aminophenols; glycidyl ethers of methylenedianiline; and epoxy *novolac* resins. (See column 10, lines 56-60). The epoxy resins used in the present invention will preferably have epoxide equivalent weights (EEW) in the range of from about 90 to about 300 (claimed polyepoxide resin) (See column 10, lines 60-66).

3. Claims 18, 19, 25, 28, 31, 32, 35, 36, 42, 45, 48, 49, 65, 66, 68-73, 75 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al '864 in view of Martin et al '523 and Beck et al '875, as applied above, and further in view of Sielcken et al (US 5585524).

As discussed above, Nguyen et al '864 further teaches that the components of the treating composition can be *blended together* using generally **any procedure which is commonly used** for preparing fracturing, frac-pack, and gravel packing compositions, e.g. by first mixing the gelling agent with brine or some other aqueous fluid to form the gelled aqueous carrier liquid, transporting the gelled aqueous carrier liquid to a mixing apparatus such as a **continuous stream** tub mixer, and **continuously adding the other components** and mixing with the gelled aqueous carrier fluid, and continuously drawing the resulting mixture from the mixer and injected the mixture into the well to a desired subterranean zone (See column 12, lines 46-66).

Nguyen et al fails to teach that a continuous process is carried out using a tubular reactor.

**Sielcken et al** teaches that a *continuous* process can be carried out using a stirred tank reactor (CSTR), a tubular reactor, a non-stirred bubble column and an internal or external gas-lift loop reactor (See column 5, lines 61-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out a continuous process of Nguyen et al '864 in a continuous stream *tubular* reactor instead of a continuous stream tub mixer since Sielcken et al teaches that a continuous process can be carried out using a CSTR or a tubular reactor.

Note that in the **continuous tubular reactor** the first flowing stream and second flowing stream would be combined and mixed while continuing to flow as a stream.

4. Claims 18, 19, 25, 26, 28, 31, 32, 35, 36, 42, 43, 45, 48, 49, 65, 66, 68-75 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphey et al (US 5,128,390) in view of Martin et al '523 and Beck et al '875, further in view of Sielcken et al '524.

Murphey et al '390 discloses a method of treating a subterranean formation comprising coating a substantially ***continuous stream*** of particulate material, e.g. sand, with a ***continuous stream*** of a *polyepoxide* resin composition in a gelled aqueous carrier liquid (See column 2, lines 56-60). The method basically comprises admixing the gelled aqueous carrier liquid, uncoated particulate material, a *polyepoxide* resin composition which will subsequently harden and a surface active agent whereby forming and suspending consolidatable resin coated particulate materials in gelled

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aqueous carrier liquid (See Abstract; column 2, lines 23-29). The particulate material is usually sand. However, other types of particulate material such as glass beads, sintered bauxite, etc. can be used if desired. Preferably, the particulate material is of a particle size in the range of from about **10 to about 70 mesh**, U.S. Sieve Series. See column 4, lines 3-19. The hardenable polyepoxide resin composition substantially **instantaneously coats the particulate material** in the presence of the gelled aqueous carrier liquid when a surface active agent is also present (See column 4, lines 20-26). The resin composition is generally comprised of a solvent system for the resin, a hardening agent, a coupling agent and a hardening rate controller (See column 4, lines 26-30). The resin coated particulate material can be utilized in the performance of gravel packing procedures or as a proppant material in fracturing treatments performed in a subterranean formation. The resin coated particulate material can also be utilized in the formation of controlled permeability synthetic formations within a subterranean zone (See column 8, lines 30-36).

Murphey et al '390 fails to teach that a composite particulate material comprising sand and a density reducing material such as polystyrene divinylbenzene; the composite being made by providing a first flow stream with dense "large" particulate material and a separate second flowing stream with a density reducing material "small" particulate material (Claims 18, 35, 68).

Martin et al '523 and Beck et al '875 is applied here for the same reasons as above.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have produced sand/SVDB particulate material that closely matches density of carrier liquids in Murphey et al '390 as composite particles having dense core particles coated with low density particles with the expectation of avoiding the settling problem, as taught by Beck et al.

Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided separately dense particulate material with a first flow stream and a separate second flowing stream with low density SVDB particulate material in Murphey et al '390 with the expectation of providing the desired particulate material with density closely matched to servicing fluid for improved packing efficiencies, as taught by Martin et al.

As to claimed on-the-fly coating, Murphey et al '390 teaches that the method is carried out by preparing an aqueous gelled carrier liquid by combining a gelling agent with the water, conducting a substantially *continuous stream* of the aqueous gelled carrier liquid to a continuous stream mixing tub or the equivalent apparatus, adding a substantially continuous stream of liquid surface active agent, a substantially continuous stream of *particulate* material to the mixing tub as is a substantially continuous stream of premixed liquid polyepoxide resin composition, and withdrawing a substantially *continuous stream of the resulting mixture* therefrom and **pumping** by way of a conduit system down the well bore into a subterranean zone wherein the resin coated particulate material is deposited and consolidated into a hard permeable mass (See column 8, lines 10-29). Note that Murphey et al '390 teaches that hardenable epoxy

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resin **coats** particulate materials such as *sand* or *glass beads* in a treating composition **substantially instantaneously** in the presence of the gelled aqueous carrier liquid and a surface active agent (See column 4, lines 20-26). Obviously, *glass beads* added to the stream comprising resin coated particles **would adhere** to resin because Murphey et al '390 teaches that the epoxy resin substantially **instantaneously coats** *glass beads* in the stream.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have *continuously* formed a composite proppant in the cited prior art by adding a first stream of epoxy resin and dense particles to a **continuous stream tub mixer** thereby forming resin coated large particles followed by adding a second stream of small particles of reduced density with the expectation of providing the desired composite proppant comprising large dense particles coated with small particles of reduced density.

Murphey et al '390 fails to teach that a continuous process is carried out using a tubular reactor.

**Sielcken et al** teaches that a *continuous* process can be carried out using a stirred tank reactor (CSTR), a tubular reactor, a non-stirred bubble column and an internal or external gas-lift loop reactor (See column 5, lines 61-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out a continuous process of Murphey et al '390 in a continuous stream *tubular* reactor instead of a continuous stream tub mixer since Sielcken et al teaches that a continuous process can be carried out using a CSTR or a tubular reactor.

Note that in the **continuous tubular reactor** the first flowing stream and second flowing stream would be combined and mixed while continuing to flow as a stream.

As to claim 42, Murphey et al '390 teaches that polyepoxide is bisphenol A-epichlorohydrin resin (See column 4, lines 34-36).

5. Claims 26, 43 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al '864 in view of Martin et al '523 and Beck et al '875 or over Nguyen et al '864 in view of Martin et al '523 and Beck et al '875, further in view of Sielcken et al '524 or over Murphey et al '390 in view of Martin et al '523 and Beck et al '875, further in view of Sielcken et al '524, as applied above, and further in view of Murphey et al (US 4665988).

The cited prior art fails to teach claimed solvent.

Murphey et al '988 teach that the use of ethylene glycol butyl ether (See column 5, line 54) as a solvent for dissolving epoxy resins (See column 5, lines 47-48) such as bisphenol A-epichlorohydrin (See column 5, line 60).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ethylene glycol butyl ether as a solvent in the cited prior art since Murphey et al '988 teach that the use of ethylene glycol butyl ether as a solvent for dissolving epoxy resins such as bisphenol A-epichlorohydrin, and Nguyen et al '864 does not limit its teaching to particular solvents.

6. Claims 28, 29, 45, 46, 75 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al '864 in view of Martin et al '523 and Beck et al '875 or over Nguyen et al '864 in view of Martin et al '523 and Beck et al '875, further in view of

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Sielcken et al '524 or over Murphey et al '390 in view of Martin et al '523 and Beck et al '875, further in view of Sielcken et al '524, as applied above, and further in view of McDaniel et al (US 20020048676).

The cited prior art fails to teach that the binder could be glycidyl ether or epoxies such as bisphenol A-epichlorohydrin resin (Claim 42) or a polyester resin or a natural resin (Claims 45-46).

McDaniel et al teaches that a liquid resole phenol/formaldehyde resin (See P53, 70, 98) or glycidyl ether or epoxies such as bisphenol A-epichlorohydrin resin (See P187) or a polyester resin (See P70) or a natural resin (See P75) can be used for binding particles together. In other words, the resins are functionally equivalent.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a resin composition comprising glycidyl ether or epoxies such as bisphenol A-epichlorohydrin resin or a polyester resin or a natural resin in the cited prior art instead of a liquid resole phenol/formaldehyde resin with the expectation of providing the desired coated particles since McDaniel et al teaches that a liquid resole phenol/formaldehyde resin or glycidyl ether or epoxies such as bisphenol A-epichlorohydrin resin or a polyester resin or a natural resin can be used for binding particles together.

### ***Response to Arguments***

7. Applicant's arguments with respect to claims 18, 19, 25, 26, 28, 29, 31, 32, 35, 36, 42, 43, 45, 46, 48, 49, 65, 66 and 68-77 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELENA Tsoy LIGHTFOOT whose telephone number is (571)272-1429. The examiner can normally be reached on Monday-Friday, 9:00AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elena Tsoy Lightfoot, Ph.D.  
Primary Examiner  
Art Unit 1715

May 13, 2010

/Elena Tsoy Lightfoot/